Estimating Contaminated Stormwater Impacts in Portland Harbor (Oregon)

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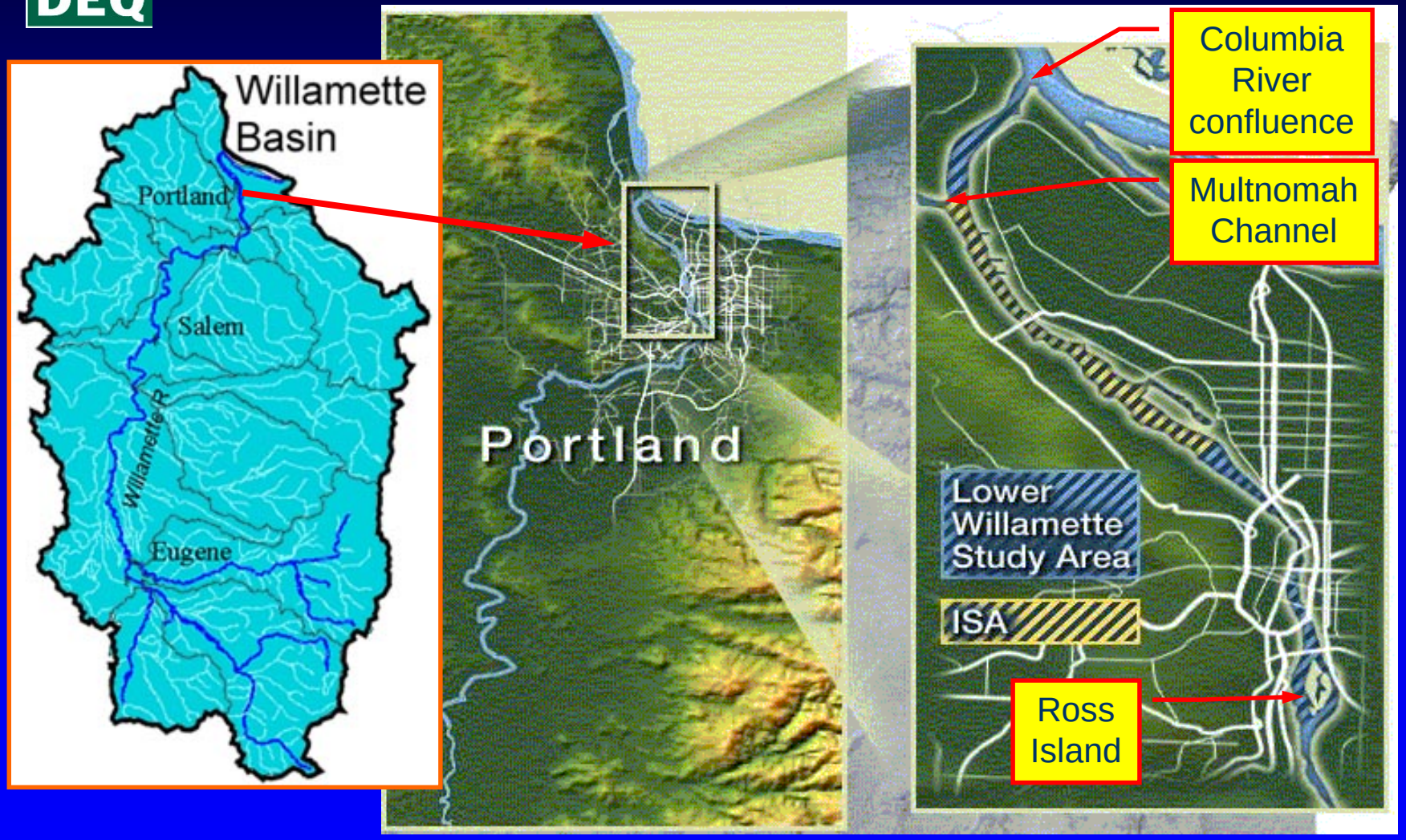
#307

Portland Harbor Geography



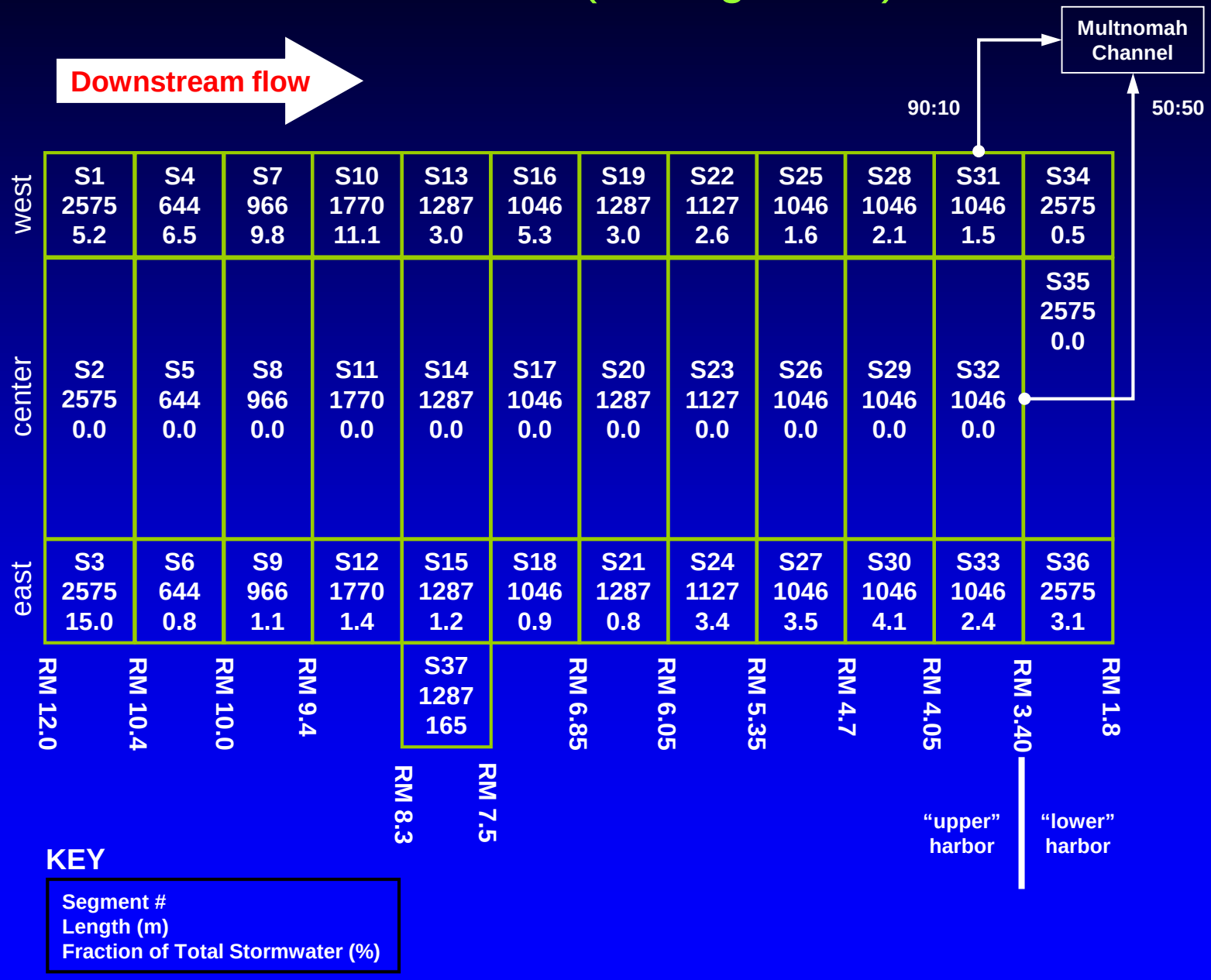
Stormwater Questions

- What impact do upstream loads have on fish and sediment?
- What impact do stormwater loads have on fish and sediment?
- What impact do sediment loads have on fish and sediment?
- How do these different loads interact?

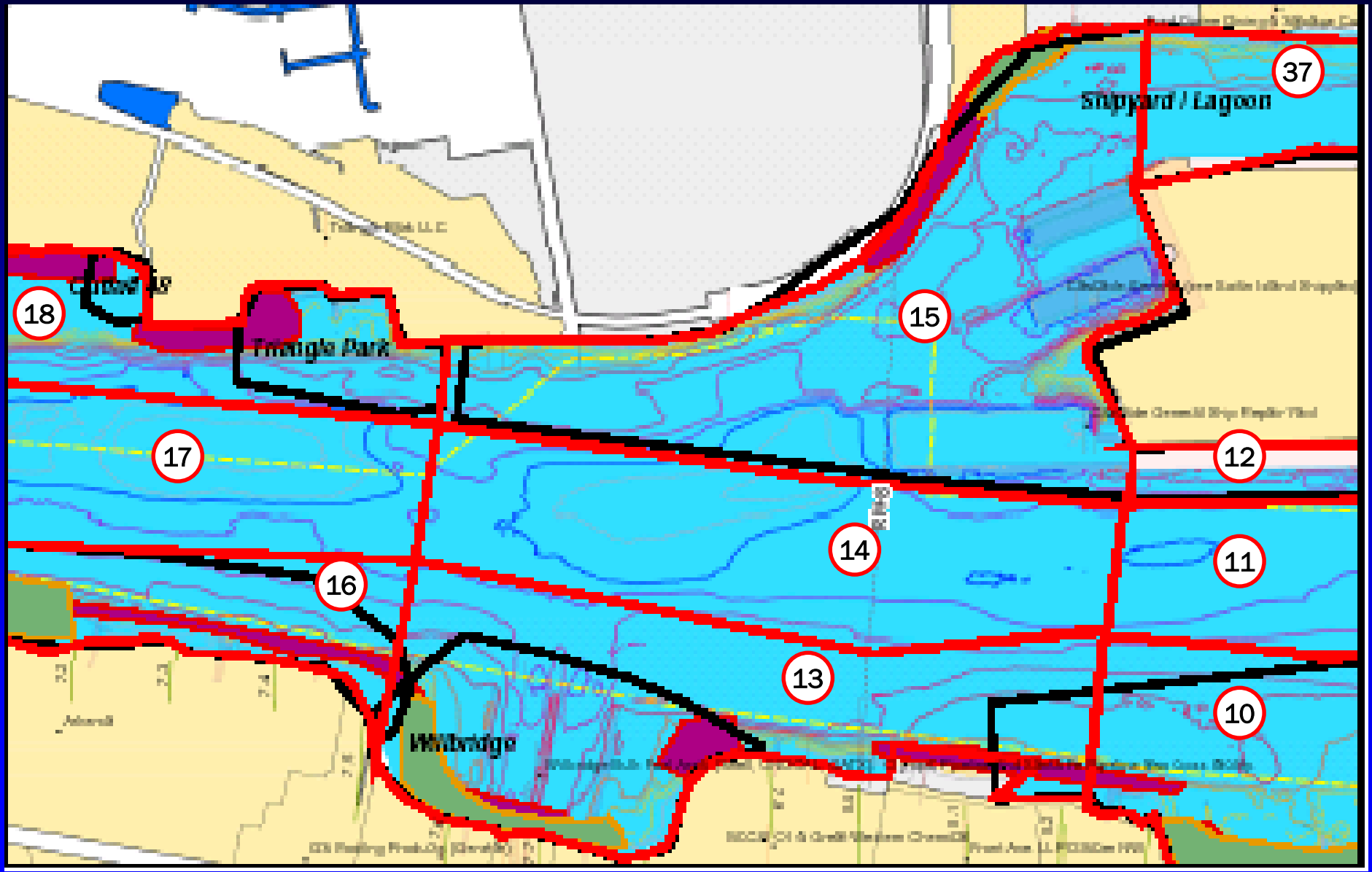
Address these questions by…

- Dividing Harbor into segments
- Organizing observed data by segment
- Introducing stormwater load by segment
- Using dynamic T&F and food web models
- Evaluating different combinations (“scenarios”) of upstream, stormwater, sediment loadings

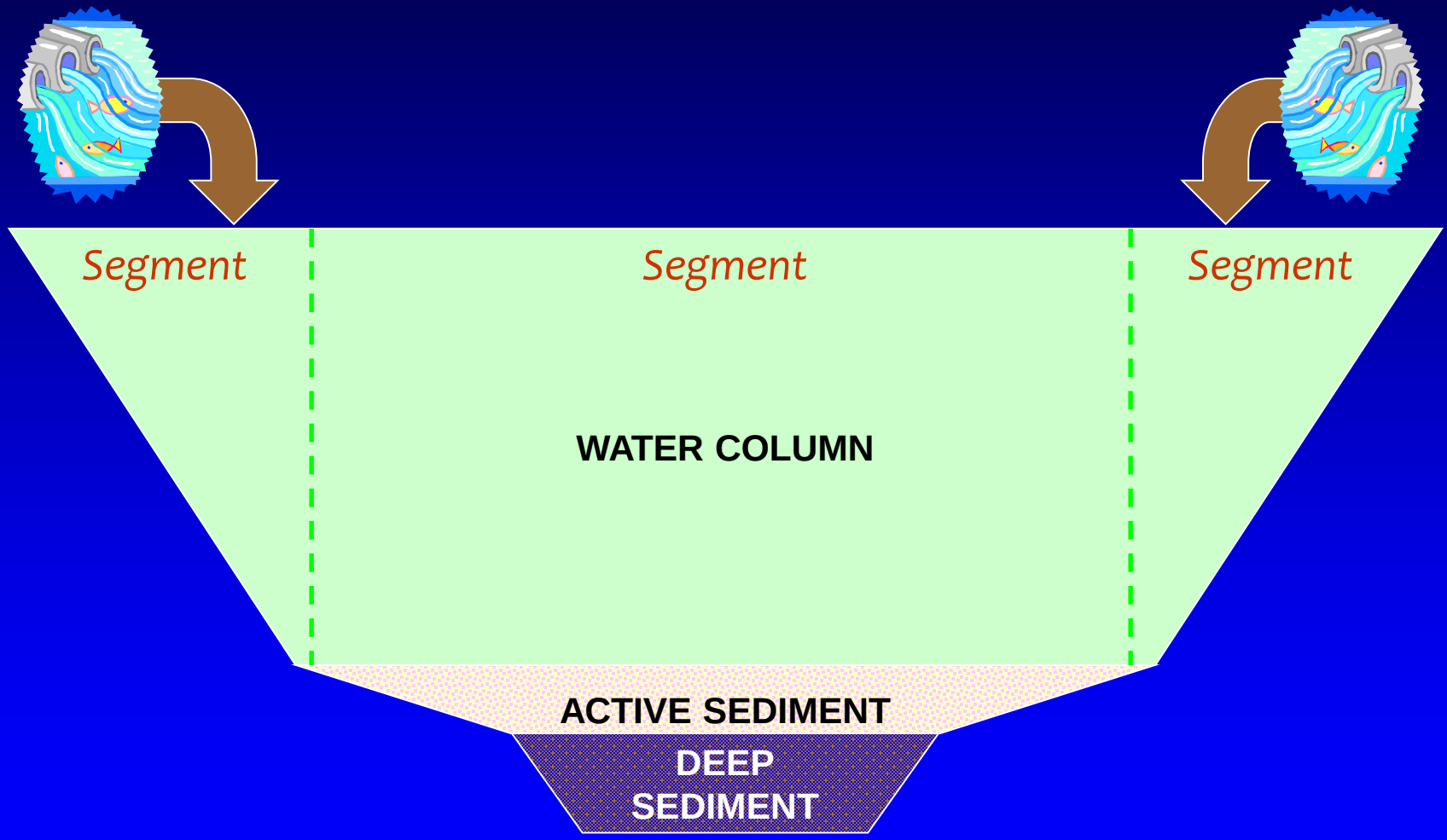
Segmentation of Portland Harbor (37 segments)



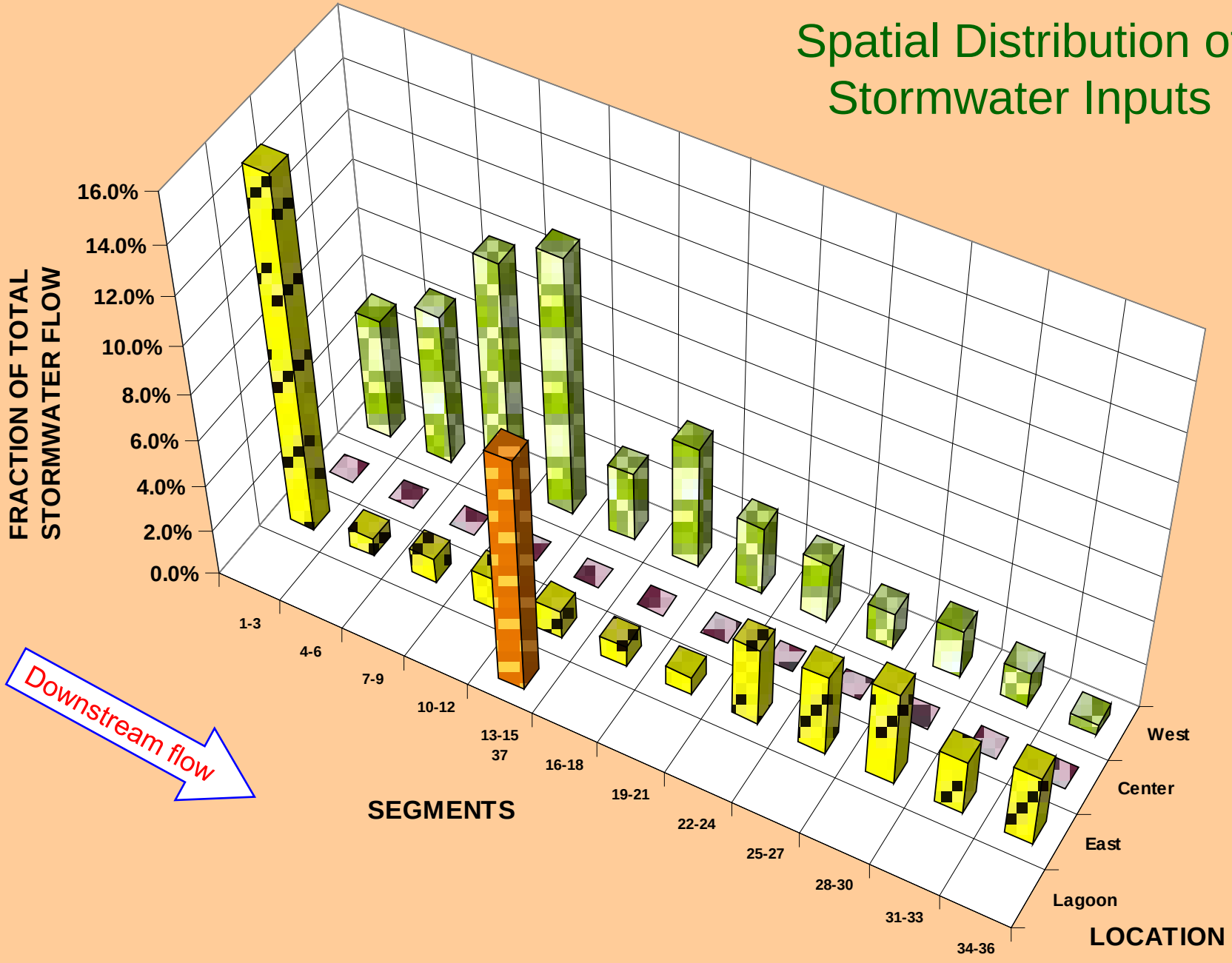
Mapping Segments to Physical River



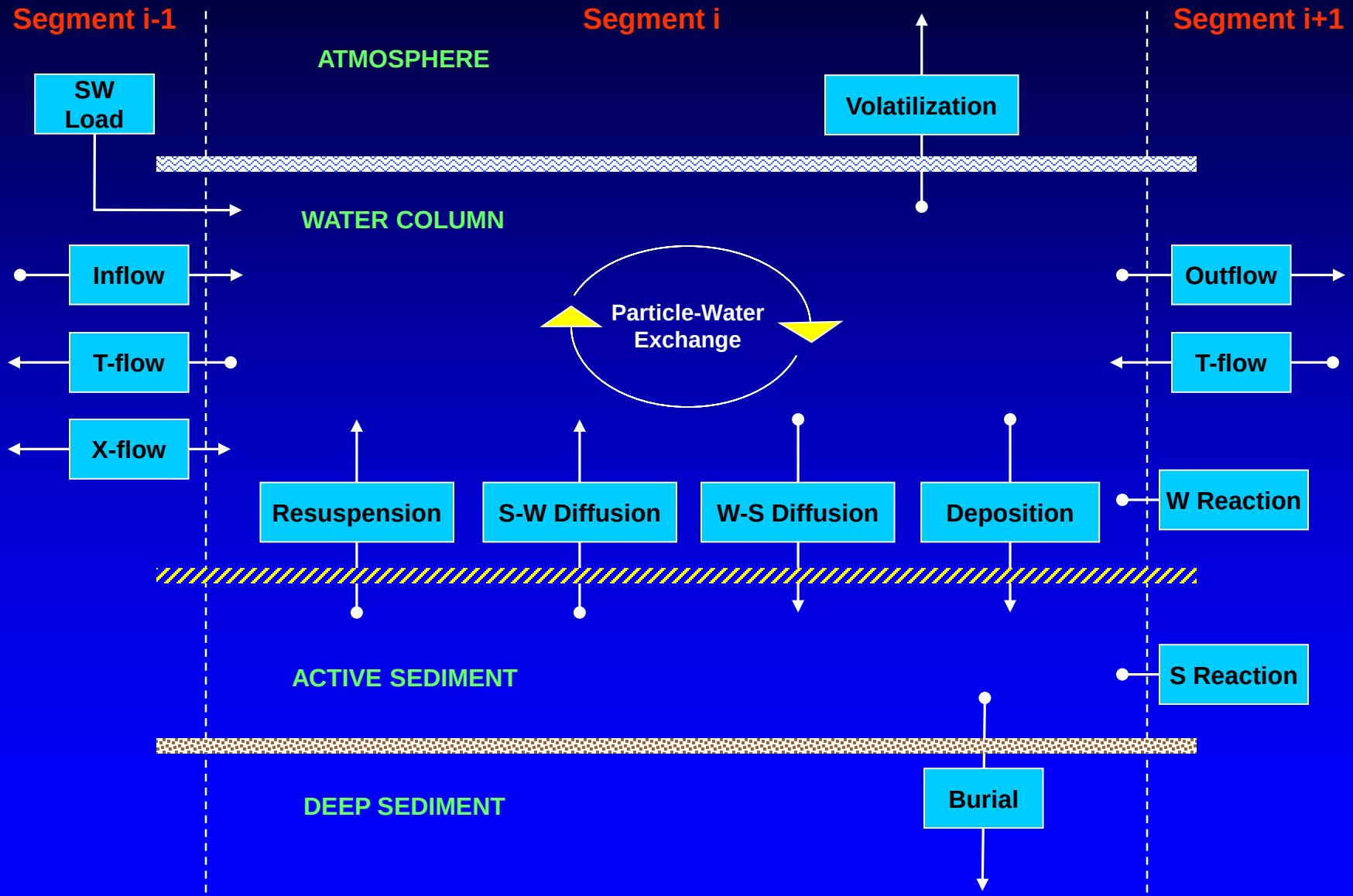
Conceptualizing Stormwater Inputs



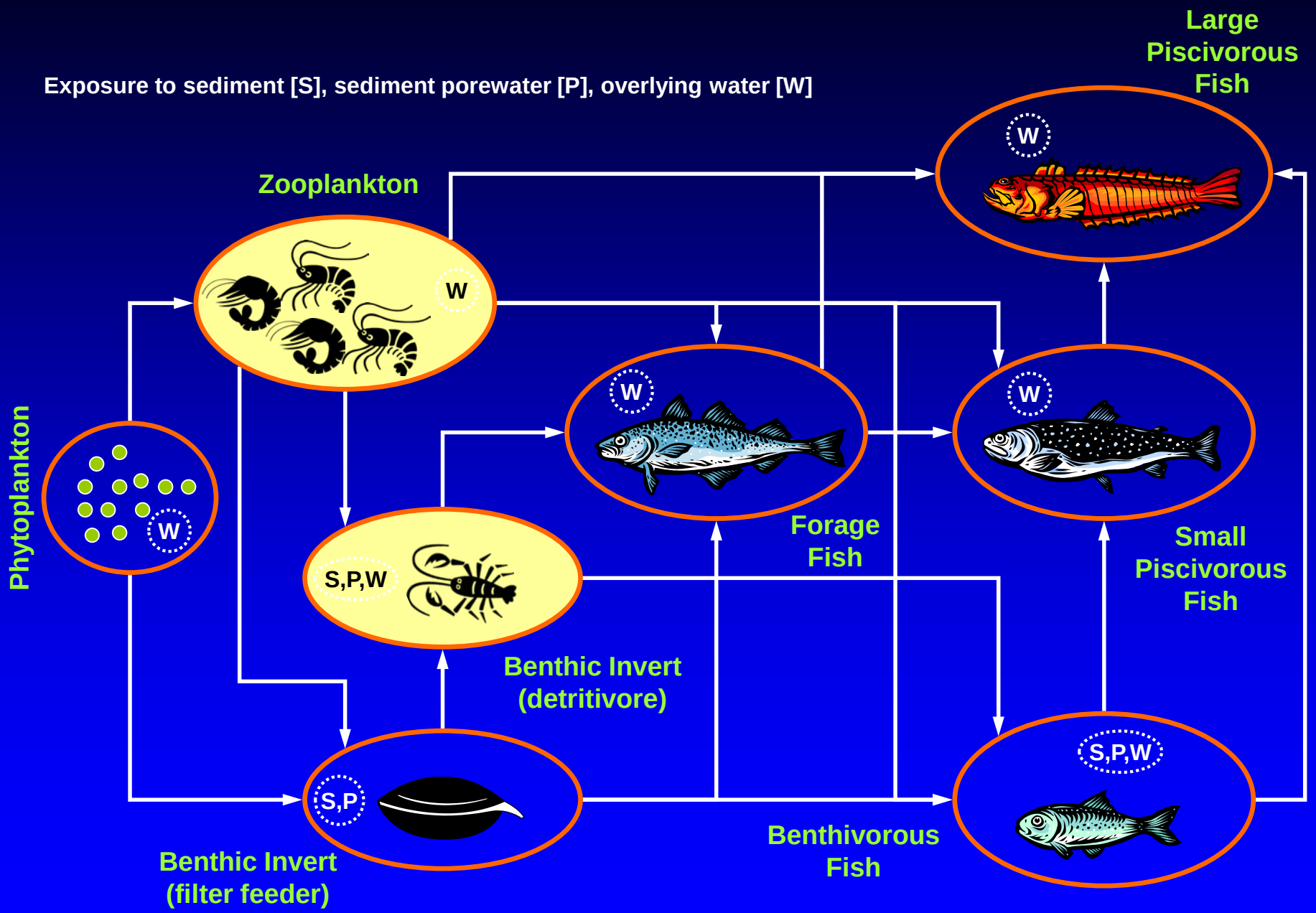
Spatial Distribution of Stormwater Inputs



Transport & Fate Model for a River Segment



Food Web Model



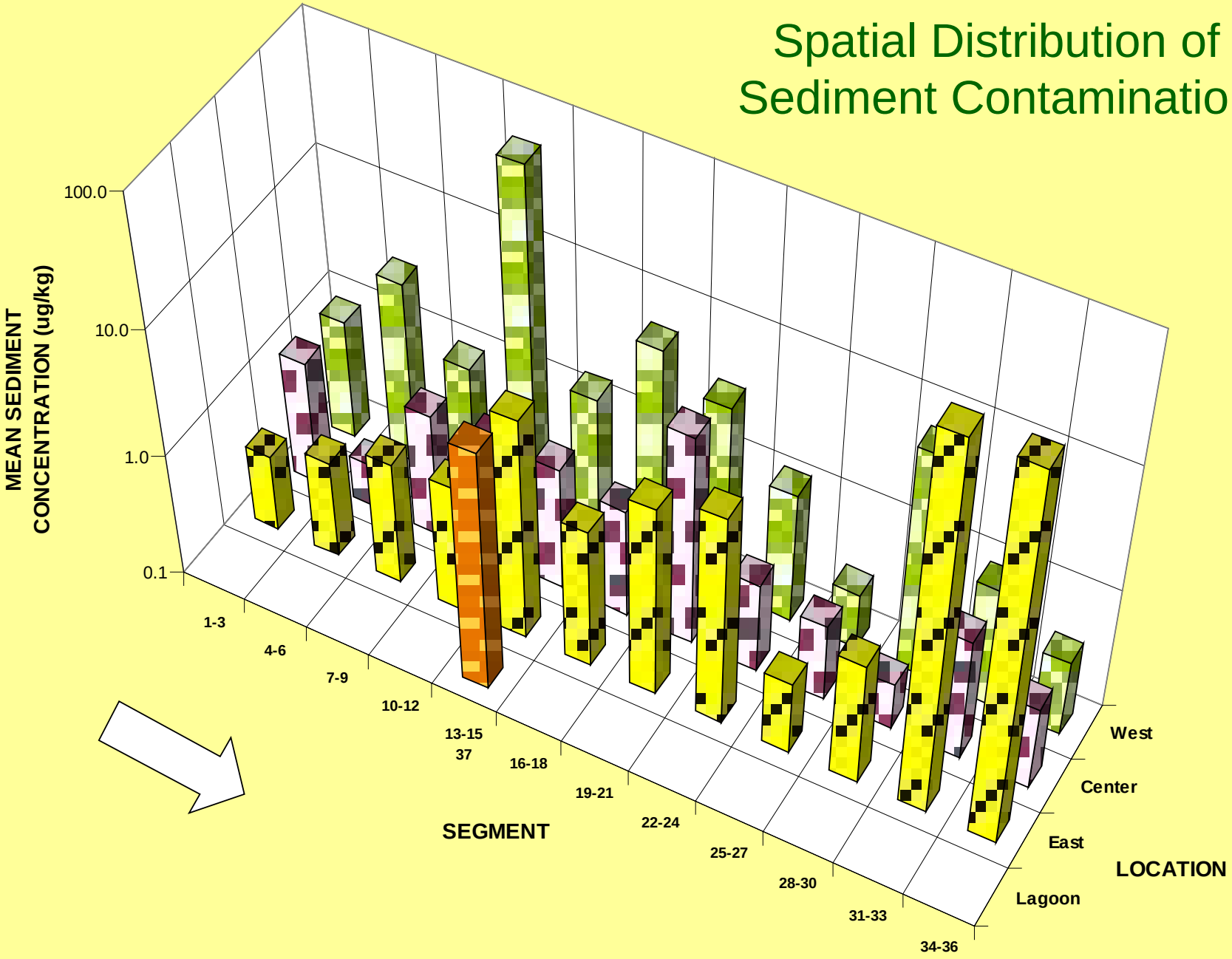
Scenarios evaluated

SCENARIO #	Upstream Input *	SW Input	Sediment Load
1	YES	NO	NO, CST = 0 †
2	YES	YES	NO, CST = 0
3	YES	YES	YES, CST = 0.012
4	YES	NO	YES, CST = 2.86
5	YES	YES	YES, CST = 2.86
6	YES	NO	YES, CST = observed
7	YES	YES	YES, CST = observed

* PCB-118 upstream mean concentration = 14 pg L^{-1}

† CST = total sediment concentration, μg kg^{-1}

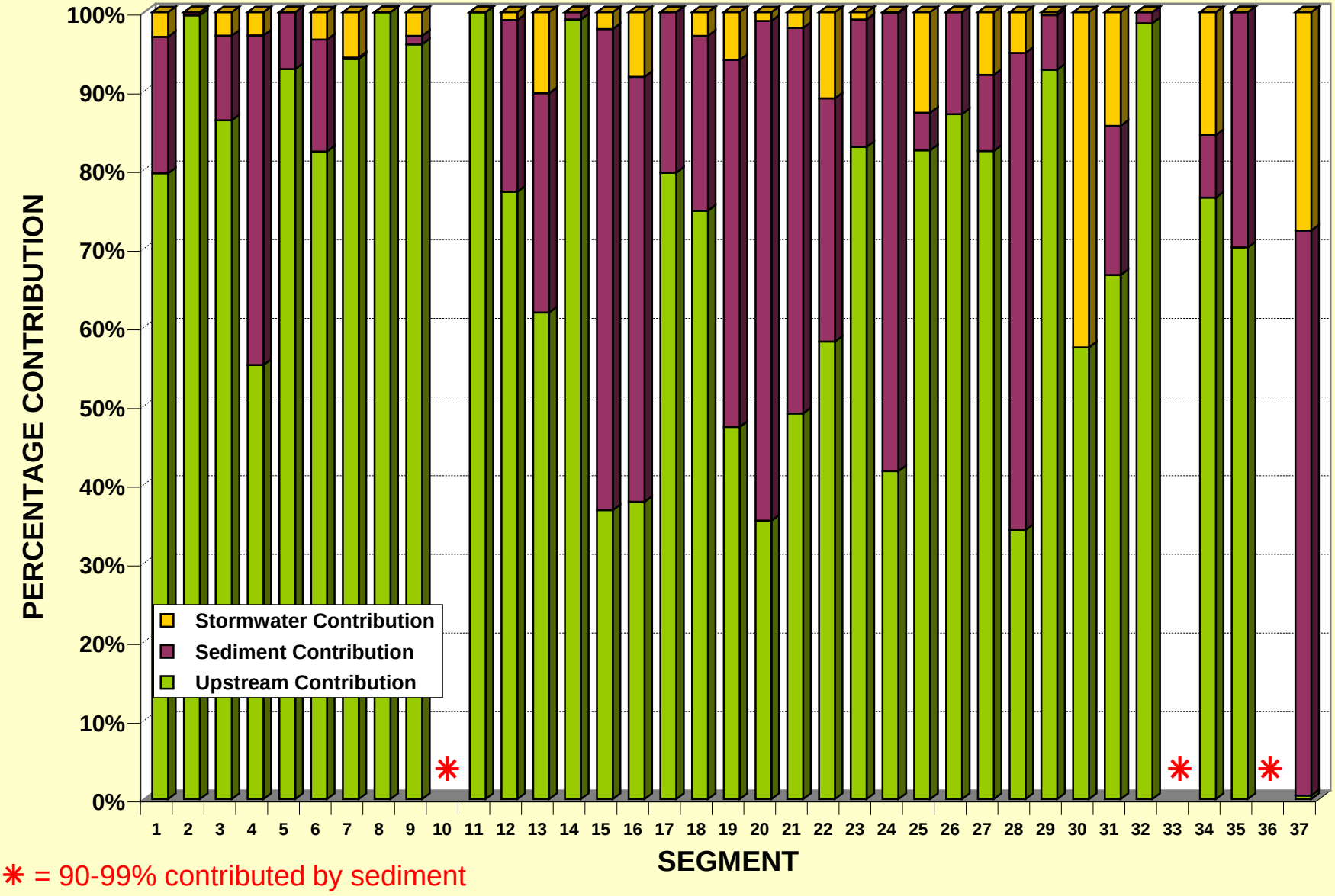
Spatial Distribution of Sediment Contamination



Results (1)

- For PCB-118
- Harbor-wide average contributions to fish tissue
  - Sediment: 85.3%
  - Upstream sources: 12.8%
  - Stormwater inputs: 1.9%
    - *May have greatest impact in Lagoon (Segment 37)*
- Contribution by source varies substantially by segment

Contributions to Fish Tissue by Segment



✳ = 90-99% contributed by sediment

Results (2)

- For PCB-118
- Harbor-wide, legacy sediment contamination is dominant source for fish
  - But not all segments are equally impacted by contaminated sediment
- For some contaminants, upstream load may keep fish near advisory levels, regardless of sediment

Fish Tissue vs. Sediment Concentrations